N-P-K Balance in a Milk Production System on a *C. nlemfuensis* Grassland and a Biomass Bank of *P. purpureum* CT-115 Clone

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Key words: Milk farming, biomass bank, N, P, K balance

Introduction In very intensive milk production systems in Europe and America with the use of high amounts of chemical fertilizers, the nutrient cycling models consider the losses of N due to leaching and volatilization, as well as the hydro-physical characteristics of the soil affecting the performance of this element (10; 6). However, in more extensive milk production systems, low input agriculture forming the natural cycle occurring within each farm, is of vital importance to potentate nutrient recycling for a stable animal production.

Objective To study the values of N, P and K inputs and outputs in a dairy farm with a sward composed by 60% of *C. nlemfuensis* and 40% of *P. purpureum* CT-115, associated with legumes in 28% of the area.

Materials and methods The grassland covered an area of 53.4 ha, composed by *C. nlemfuensis* (60%), *P. purpureum CT*-115 (40%) and *L. leucocephala* and *C. cajan* legumes intercropped in 28% of the area. The dairy herd consisted of 114 cows, 35 replacement heifers and 24 calves. There was a milk yield of 100,000 litters and the animals consumed 825 t DM from pastures and 75.1 t DM from other supplementary feeds. Nutrients extracted by pastures, nutrients intook by animals from pastures, symbiotically N fixation by legumes and N, P and K determinations outside the system due to animal production were determined (3-11). Volatilized ammonia, nutrient input and litter accumulated in the paddocks were measured once each season.

Results and discussion In the whole system the balance indicates negative values of N, P and K. Out of the total amount of nutrients consumed, animals used only 16 kg N, 5 kg P and 4 kg K for milk production, LW gain and calf production, the remainder returned to the system through excretions. Hence, more than 90% of the N and K, and approximately 81% of the P consumed by the animals were added to the system through excretions. These results agree with those reported by Jarvis (1993) and Cadish (et al., 1994). However, 40% of the excretions occurred in the shade buildings and milking parlours and thus these nutrients did not return to the system. An important internal recycling mechanism, especially for nitrogen and potassium, is their remobilization by the rejected pasture to re-use them for the regrowth activity. This is of particular interest in CT-115 Bank, since stems of CT-115 plants left after grazing remobilize an important amount of these nutrients, guaranteeing a favourable pasture regrowth (Martinez 1996).

Table 1 *N, P and K balance in the system, kg/ha/year.*

Inputs and outputs	N	P	K
External inputs			
Fertilizer	14	-	-
Rainfall	27	-	-
Supplements	16	7	26
Biological N	12	-	-
Internal recycling			
Extracted by pasture	320	57	237
Remobilization	36	5	34
Excreted by the animals	165	33	152
Consumed by the animals from pasture	176	31	130
From litter	11	2	9
Outputs			
Animal products	16	5	4
N volatilized	11	-	-
Losses outside the system	70	13	61
Balance in the system (Inputs-outputs)	-28	-11	-39

Conclusions and perspectives The return of all the excretion to the grassland is recommended as well as increasing the area of legumes to attain a satisfactory balance of N, P and K in the system. Further studies must consider maintenance fertilization, nutrient losses due to leaching and denitrification, as well as variation of the stable OM in the soil and the influence of hydro physical properties in the recycling process.

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